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ABSTRACT

Guidelines are presented for incorporating screening and assessment into a sequential and comprehensive model of preschool intervention services. At-risk children who may receive intervention services and an ecological intervention model are described. Three categories of children may benefit from services of early intervention programs: children who are biologically at risk because of organic problems; children who are suspected to be at risk because of organic difficulties often associated with later problems; and children who are environmentally at risk because of social and interactional influences. An ecological model of early intervention services consists of a series of comprehensive steps: (1) case finding; (2) screening; (3) comprehensive assessment; (4) development of an intervention plan; (5) implementation of the intervention plan; (6) program monitoring and follow-up; and (7) development and implementation of a transition plan. Among the technical issues in planning and evaluation are the limitations of standardized tests in terms of reliability and construct validity. The criteria used to make decisions from screening and assessment must incorporate information about referral and eligibility rates and the validity of decisions. Five tables present information from previous studies to illustrate the discussion. (SLD)

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Planning and Evaluating Preschool Screening and Assessment Programs

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Early intervention services for at-risk preschool children and their families have acquired increased importance in recent years. The need for interventions for young, at-risk children and their families is supported by the following: (1) research has consistently found that early experiences are important for optimal development of children, (2) research has suggested that developmental risk factors of young children interact with family, socioeconomic, and other environmental factors to have a negative and spiraling effect throughout children's lives, (3) early intervention services for at-risk children are potentially cost-effective, with early intervention costing substantially less than later services such as special education and grade retention (Harrison, Carey, Long, & Brumback, 1989; Keogh, Wilcoxen, & Bernheimer, 1986). An excellent summary of the rationale for early intervention services was provided by Hobbs (1975): "Prevention is more effective and more economical, as a rule, than repair; it is better to identify problems early and correct them promptly than to let them grow until a crisis requires action." (p. 89).

Several federal programs have been designed to provide intervention services for young, at-risk children, including Head Start, Crippled Children's Services, and the Early and Periodic Screening, Diagnosis, and Treatment amendment to Medicaid legislation (Keogh et al., 1986). More recent legislation, Public Law 99-457 Education of the Handicapped Act Amendments of 1986, mandated comprehensive assessment and intervention for young children and their families. Public Law 99-457, which provides federal money to support early intervention services, indicates that states may implement procedures to identify and serve children who are handicapped, developmentally delayed, and/or at-risk. States are given much flexibility under the law in setting eligibility criteria for the children who may receive services, with some states setting criteria to serve only those children who meet criteria for specific handicaps, such as the criteria used with school-age children, and some state providing services for a broader range of at-risk children. Intervention services for preschool children may include parent and family training, speech and language services, special education, health services, psychological services, and other services.

Schools and agencies who provide intervention services for preschool children must systematically plan screening and assessment programs. The programs often focus only on determination of which children may be eligible for services. However, screening and assessment should be consistent with the goals and expected outcomes of preschool intervention and should culminate in implementation of individualized intervention plans and monitoring of program effectiveness. The purpose of this paper is to describe guidelines for incorporating screening and assessment into a sequential and comprehensive model of preschool intervention services. In the paper, at-risk children who may receive intervention services and an ecological approach will be described. The limitations of using standardized instruments to screen and assess preschool children's development and behavior will be discussed. Finally, the outcomes of screening and assessment will be summarized and illustrated in order to support sound practices for planning and evaluation.

At-Risk Children and Early Interventions

According to Keogh et al. (1986), three categories of at-risk young children may benefit from the services provided in early intervention programs. Children who are biologically at-risk have organic problems (e.g., sensory or physical handicaps, Down syndrome) that usually have a significant effect on development and behavior; the organic problems are apparent at birth or become apparent during infancy. Children who are suspect at-risk have organic difficulties (e.g., prematurity, low birth weight) that are often associated with later problems. The largest group of at-risk children are those who are environmentally at-risk because of social and interactional influences.

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There is evidence to support that risk factors associated with learning, development, and behavior problems of young children may be increasing and that the future will see larger numbers of at-risk children. For example, the Children's Defense Fund (1990) reported that no single state currently provides adequate prenatal care services for all pregnant women who require them. Only 5 states have made significant progress in reducing the rate of low birth weight infants The teen pregnancy rate in the United States is twice is high as that of any other industrialized nation, and 1 in 5 teenage girls bear a child. Only 59% of all eligible mothers and children receive WIC benefits, and the proportion of children living in poverty has increased by 23%.

Surprising, studies investigating the effectiveness of early interventions for at-risk children offer mixed results. Some research suggested that, while cognitive gains as a result of early intervention are short-term at best (e.g., Royce, Darlington, & Murray, 1983), early intervention programs may result in long term benefits such as reduced probability for special education referral and grade retention and increased probability for completion of high school and employment (e.g., Bryant & Ramey, 1987). On the other hand, Haskins (1989) reviewed findings from the Consortium for Longitudinal Studies (studies which employed experimental procedures) and Head Start studies (studies of variable quality) and reported that only the Consortium studies found significant and robust long term effects for placement in special education and retention. White (1985) conducted a meta analysis of 326 studies investigating the effects of early intervention programs for medically at-risk children, handicapped children, and disadvantaged children and found small long-term effects. Both Haskins and White suggested that there is a great need for more sound research to investigate long-term factors associated with early intervention .

Steps in Early Screening, Assessment, and Intervention According to an Ecological Model

An ecological model must be incorporated into all steps of early intervention services (Bronfenbrenner, 1979; Guralnick & Bennett, 1987; Haskins, 1986; Hobbs, 1975; Paget & Nagle, 1986). In an ecological model, the complex interactions between children's development and behavior, the environments in which children participate (home, school, and community), and the significant others within the environment (parents, families, teachers, and peers) must be the focus during screening, assessment, and intervention. An ecological model is particularly important for screening and assessment of young children, whose developmental needs differ from those of school age children. During screening and assessment, direct testing cannot provide the only source of information about children; because young children's behaviors varies in different settings and in response to different persons within the setting, screening and assessment must include naturalistic observations of children's behavior at home and at school and the use of interviews with parents, teachers, and others. Interventions should not only be directed at remediation of problems within children; improvement of parenting skills and family functioning, removing environmental barriers within the home and school, and enhancing cooperation between home and school also represent just a few of the goals of early intervention programs.

Early intervention services consist of a series of comprehensive steps. The steps should be planned according to comprehensive goals and expected outcomes for preschool services that have been adopted by the agency. Each step should incorporate an ecological model with a focus on the interactions between children, settings, and other people within the children's environment. Finally, each step should provide information that assists in planning the steps that follow; a comprehensive plan for early intervention should avoid a focus on gathering isolated information at each step.

The steps in early intervention services have been described by Barnes (1982) and Lichtenstein and Ireton (1984). The first step, <u>case finding</u>, serves to establish contact with parents and professionals in preschool and health agencies and obtain information about the need for services. The purpose of case finding is to identify possible segments of a community population that may benefit from services. Case finding may occur on a continuum from selective case finding to mass case finding. Selective case finding may identify segments of a population for which there are known, current risk factors and problems, while mass case finding identifies a larger portion of the population for which there may be no current or no specifically isolated risk factors.

The second step is <u>screening</u>. As with case finding, screening programs may occur on a continuum from selective screening to mass screening. The goal of early screening is to distinguish potentially at-risk children from those who are

apparently risk-free and, thus, to select the children who are most likely to have problems. Early screening provides global information about children and their families with a restricted and limited sampling of information. Screening does not identify children who are eligible for intervention services, but identifies children who will be referred for more comprehensive assessment. From an ecological perspective, screening should sample information about children, and behavior of children in different settings and in response to different people within the settings in order to provide information to plan comprehensive ecological assessment and to plan the type of early intervention services children will receive.

If children are identified as potentially at-risk as a result of screening, the third step is comprehensive assessment. While comprehensive assessment is usually conducted to determine if children meet eligibility criteria for special services, comprehensive assessment should also be conducted to gather information for planning intervention services. Comprehensive assessment should be conducted in areas of particular concern noted during screening and should be conducted by a multidisciplinary team. As with screening, comprehensive assessment should be undertaken from an ecological perspective and may include measures of children's development, observations of children's functioning in a variety of settings, and measures and observations of family functioning and dynamics. As suggested by Paget (1990), direct testing of young children must be supplemented with numerous other procedures for developing hypotheses about children's competence because of numerous limitations (e.g., limited attention span, inexperience with test-taking) of direct testing of young children. Paget described procedures such as assessment in natural contexts (e.g., preschool classroom and home) observation of children's play, and informal assessment of children interactions with the examiner during direct testing as useful supplements to direct testing.

Following comprehensive assessment, a decision is made about the need and eligibility for early intervention services. Then, the fourth step, development of an intervention plan, occurs. The intervention plan describes child and family functioning, the nature of services to be provided, and the expected outcome of the services. Following the fifth step, implementation of the intervention plan, the sixth step is program monitoring and follow-up. Monitoring and follow-up include formative and summative evaluation of children's progress. With early intervention services, the seventh and final step is development and implementation of a transition plan. The transition plan includes procedures for promoting children's placement into the next, less restrictive environment, which for many children is a regular preschool or kindergarten program.

Technical Issues in Planning and Evaluating Preschool Screening and Assessment Programs

Limitations of Standardized Tests

Bracken (1987) and Ittenbach, Harrison, and Deck (1989) have identified several technical limitations of standardized screening and assessment instruments which should be taken into account when planning programs and using instruments to make decisions and intervention plans for preschool children. One limitation is the reliability of the instruments. Many standardized preschool instruments have lower reliability than comparable instruments used for school-age children, adolescents, and adults. Preschool screening instruments, in particular, are characterized by fewer items and limited samples of behavior, and as a result are less reliable. Bracken suggested test-retest reliability of preschool instruments is affected by irregular rates of development and variable behavior of preschool children and that evidence of short-duration test-retest reliability should be emphasized when selecting a preschool screening instrument.

A second limitation of standardized preschool measures concerns the developmental nature of the constructs that are measured. Constructs typically measured by standardized tests, such as intelligence, concept formation, and verbal ability, are not well defined for any age level, but are particularly difficult to define and measure at the preschool level. Many preschool instruments measure these constructs as if they are defined in the same way for preschool children, school-age children, or adults, but simply require "less" or fewer correct answers for preschool age children, and many preschool instruments do not consider the qualitative differences between the development of preschool and older children. When planning screening and assessment programs, professionals must take into consideration the limited interpretations that can be made about the constructs being measured by standardized preschool instruments.

A third limitation of standardized preschool instruments is the test floor. According to Bracken, a test floor is "a representation of whether there are sufficient numbers of easy items to distinguish between children of average and below average abilities." (p. 320). An inadequate test floor is particularly problematic for preschool screening and assessment, because even young children who function in the average range may often respond correctly to only a few test items. Thus, there is little distinction between average and developmentally delayed or at-risk children. Many preschool screening and assessment instruments have an inadequate test floor for the very youngest children in the age range of the test.

Finally, the norm-referenced scores for standardized preschool measures are often based on limited standardization samples. Many standardization samples for preschool instruments do not adequately represent the population of children who are assessed with the instrument; the samples are often restricted to a few cities within a few states and to children from a narrow range of socioeconomic and ethnic backgrounds. Many samples are samples of convenience selected from private day care programs. The samples often include children whose development is in the average to above average range and do not include children whose development is below average or atypical.

These limitations of standardized measures for preschool children do not necessarily prevent their use in screening and assessment programs. However, the user of these instruments must always take into account the limitations when selecting the instruments and interpreting the results. When these limitations are coupled with the practical issues in administering a standardized instrument to preschool children and the limited ecological validity of an assessment that is conducted in an artificial testing situation, the need to supplement standardized assessments with observations and assessments in a number of natural setting and with interviews and assessments with parents, teachers, and day care providers becomes imperative. In addition, professional judgement must always play a role in using the results of assessment to make decisions about children eligibility for early intervention programs.

Outcomes of Preschool Screening and Assessment Programs

Two issues must be considered when evaluating the outcomes of preschool screening and assessment programs. The first issues concerns the criteria that are used to determine if, as a result of screening, children will be identified as potentially at-risk and referred for more comprehensive assessment, and the criteria that are used to determine if, as a result of comprehensive assessment, children will be identified as eligible for intervention services. The second issue concerns the decision validity of preschool screening and assessment in determining the children who are actually at-risk or handicapped.

Criteria for At-Risk or Eligibility. Agencies utilize numerous types of criteria to determine children who will be referred for more comprehensive assessment as a result of screening and to determine children who are eligible for intervention services as a result of comprehensive assessment. Some agencies emphasize global development of children, and utilize criteria based on scores from general developmental measures and information from other types of assessment that focus on general development of children. Other agencies may emphasize multiple areas of development and functioning. For example, the following represents types of criteria, based on standardized screening instruments, that may be used in decisions to identify the children who may be potentially and risk and will be referred for further assessment:

* children are referred only if their total scores on the instrument fall below the cut-off,
* children are referred only if their scores in a particular area of concern to the agency (cognitive, motor) fall below the cut-off,
* children are referred if their scores in any one area fall below the cut-off,
* children are referred if their scores in several developmental areas fall below the cut-off.

Agencies may utilize similar criteria, based on comprehensive assessment, to make decisions about the children who are eligible for intervention services. The percentages of children who are referred for more comprehensive assessment, or the referral rate, may differ dramatically for different screening criteria. The percentages of children who are determined to be eligible for interventions services, or the eligibility rate, may also differ dramatically for different assessment criteria. Screening agencies must carefully consider the referral and eligibility rates that will result from

different criteria and select the criterion or criteria that are consistent with the goals of the services provided by the agency.

Data from the standardization of the Early Screening Profiles (Harrison, et al., 1990) illustrate the different referral rates obtained from different screening criteria. The Early Screening Profiles is a developmental instrument that screens development in the areas of cognitive/language, motor, and self-help/social. Standard scores (mean of 100, standard deviation of 15) for each of the developmental areas, as well as a total screening composite of the three areas, are available for this screening instrument. Table 1 reports the referral rates that would be yielded from several examples of screening criteria.

Table 1
Referral Rates from Several Examples of Screening Criteria Utilizing Standardization Data from the Early Screening Profiles

Criterion	Referral Rate
Total Screening score of 85 or below	16%
Cognitive/Language score of 85 or below	16%
Cognitive/Language score and Motor score 85 or below	7.5%
Score of 85 or below in at least one developmental area	31.5%
Score of 85 or below in at least two developmental areas	11.5%

Decision Validity. The validity of preschool screening and assessment is best evaluated according to decision theory, or the hit-rate model (Kaye, 1986; Lichtenstein & Ireton, 1984). With the hit-rate model, the effectiveness of screening and assessment decisions is evaluated according to the accuracy in determining the children who are actually at-risk, developmentally delayed, or handicapped. Similarly, because early intervention programs are also concerned with the prevention of later learning and behavior problems, the effectiveness of screening and assessment decisions is evaluated according to the accuracy in determining the children who would actually have later learning and behavior problems if early intervention was not provided. Thus, decision validity of screening and assessment must incorporate extensive concurrent and predictive studies.

Four classifications describe accurate and inaccurate decisions from preschool screening and assessment, as illustrated in Table 2. The classifications of true positive and true negative represent accurate screening and assessment decisions, while the classifications of false positive and false negative represent inaccurate screening and assessment decisions. Obviously, no screening or assessment technique will result in accurate decisions for every child, but agencies must weigh the pros and cons of inaccurate decisions when planning and evaluating programs. If a large percentage of children fall in the classification of false negative, children who are actually at-risk will not be identified by the screening or assessment and may not receive beneficial intervention services. On the other hand, if a large percentage of children fall in the classification of false positive, children who are actually not at-risk may experience the negative effects of an at-risk label or receive costly intervention services.

Agencies may take into account the probability of false negative and false positive rates by carefully evaluating the decision validity of different criteria used to make referral decisions from screening and eligibility decisions from assessment. Evaluation must take into account the base rate, or an estimate of the percentage of children in a population who have the condition for which intervention services will be provided. If the agency sets criteria to yield referral or eligibility rates that are higher than the base rate, most of the children who are referred from screening or determined to be eligible for services as a result of assessment will actually be at risk (true positives), but a relatively large percentage of children will fall in the false-positive category. If the agency sets decision criteria that yield referral or eligibility rates similar to the base rate, the percentage of children who fall in false-negative category increases. It is generally

recommended that criteria for referral and eligibility decisions be set to yield rates that are somewhat higher than base rates in order to minimize the percentage of children who fall in the false-negative category, yet yield a practical percentage of children who fall in the false positive category.

Table 2
Application of the Hit-Rate Model to Preschool Screening and Assessment Decisions

Screening/Assessment Decision	Actual Status: At-Risk	Actual Status: Not-At Risk	
At-Risk	True Positive (10)	False Positive (10)	(20)
Not At-Risk	False Negative (5)	True Negative (75)	(80)
	(15)	(85)	(100)

Sensitivity = 10/15 = 66%
Specificity = 75/85 = 88%

Note: The term "at-risk" is used for convenience in the table. In practice, screening/assessment decisions and actual status may refer to children who are handicapped, developmentally delayed, or at-risk.

The decision validity of screening and assessment emphasizes the sensitivity and specificity of the decisions. As seen in the hypothetical example in Table 2, the sensitivity of a decision is the number of children who fall in the classification of true-positive divided by the total number of children who actually have the condition. The specificity of a decision is the number of children who fall in the classification of true negative divided by the total number of children who do not actually have the condition. In the example, the sensitivity of the screening/assessment decision is 66%, indicating that 66% of the children who actually have the condition were identified as a result of screening or assessment. The specificity of the screening/assessment decision is 88%, indicating that 88% of children who do not actually have the condition were not referred or determined to be eligible.

Tables 3 through 5 illustrate the hit-rate model, utilizing concurrent and predictive validity data for the Early Screening Profiles. (The validity studies used in Tables 3 through 5 are reported in the manual for the Early Screening Profiles. In Tables 3 through 5, the criterion used to make a decision of at-risk based on the Early Screening Profiles was a total screening standard score of 85 or below). In Table 3, a study by Norton investigated the validity of decisions from the Early Screening Profiles total scores in determining children ages 3 to 7 years who were actually receiving special intervention services at the time the instrument were administered. The sensitivity and specificity of the screening decision, as reported in Table 3, indicates that the screening decision correctly identified 92% of the children who were actually receiving services and 77% of the children who were not receiving services, respectively. In Table 4, a study by LaQua investigated the validity of decisions from the Early Screening Profiles in determining children ages 5 1/2 to 7 years who were receiving special intervention services a year following administration of the instrument. (During this validity study, the Early Screening Profiles was not used to make decision about those children who should receive special services). The sensitivity and specificity of the screening decision, as reported in Table 4, indicates that screening decision correctly identified 67% of the children who later received special services and 88% of the children who later did not receive special services, respectively. In Table 5, a study by Harrison, Holder-Brown, and Schmitt investigated the validity of decisions from the Early Screening Profiles in identifying kindergarten children who experienced reading problems a year later in first grade, according to teacher grades. The sensitivity and specificity of the screening decision, as reported in Table 5, indicates that the screening decision correctly identified 50% of the children who experienced later reading

problems and 92% of the children who did not experience later reading problems, respectively.

Table 3
Decision Validity of the Early Screening Profiles in Identifying Children Currently Receiving Special Services (Norton)

	Actual Status	
Screening Decision	Special Services	No Special Services
At-Risk	12	18
Not At-Risk	1	59

Sensitivity = 92%
Specificity = 77%

Table 4
Decision Validity of the Early Screening Profiles in Identifying Children Who Were Receiving Special Services a Year Later (LaQua)

	Actual Status	
Screening Decision	Special Services	No Special Services
At-Risk	22	18
Not At-Risk	11	133

Sensitivity = 67%
Specificity = 88%

Table 5
Decision Validity of the Early Screening Profiles in Identifying Children Who Were Having Reading Problems a Year Later (Harrison, Holder-Brown, and Schmitt)

	Actual Status	
Screening Decision	Reading Problems	No Reading Problems
At-Risk	3	4
Not At-Risk	3	44

Sensitivity = 50%
Specificity = 92%

Conclusions

This paper has attempted to support the need for careful and comprehensive planning and evaluation of preschool screening and assessment programs. The following general recommendations are made for planning and evaluating screening and assessment programs: (1) The developmental needs of young children and their families, and the qualitative differences in development between preschool and older children, should be recognized, (2) An ecological approach, that involves families and teachers and utilizes supplements to direct testing, is essential, (3) Each step in early intervention services, including the steps of screening and assessment, should provide information that is utilized in the next step, (4) The limitations of standardized measures of young children's functioning should be evaluated and recognized when using results of the measures for making decisions, and (5) Criteria that are used to make decisions from screening and assessment should incorporate information about referral/eligibility rates and validity of the decisions.

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